City of Eugene, Oregon
Operational Greenhouse Gas Inventory
Fiscal Year 2019

Report prepared by Good Company, December 2020

INTRODUCTION

Historically, the City of Eugene has conducted operational fossil fuel use and greenhouse gas (GHG) emissions inventories based on these fiscal years: 2000, 2005, 2010, 2013, 2016, and 2017. This inventory, based on FY 2019 data, provides an update to allow the City to assess its progress towards meeting the Climate Recovery Ordinance (CRO). This inventory uses 2010 as a baseline year to align with the CRO. To align with GHG inventory protocol, the CRO categorizes emissions by scope. The Climate Recovery Ordinance (CRO) Goals[1] related to City Operations are as follows:

- GHG neutrality by 2020 (with a minimum of 60% reduction from 2010 levels - Scope 1 and 2[2] emissions)[3]
- 50% reduction in fossil fuel use by 2030 (based on a 2010 baseline).

The sources of the City of Eugene's fossil fuel use and GHG emissions include natural gas combustion, gasoline and diesel combustion by city-operated vehicles and equipment, and electricity use.[4] Historical data also includes emissions from district steam use, which was discontinued in 2013.

SUMMARY OF FINDINGS

Meeting the CRO Goals

Emissions from operations total **6,126 MT CO_2e** for fiscal year 2019. Between 2010 and 2019, the City's total GHG emissions have *decreased* by 1,150 MT CO_2e, or -16% compared to 2010.[5, 6] This is primarily the result of Eugene's fleet shifting from fossil fuel diesel to renewable diesel, the discontinuation of district steam energy for heating in 2013, and a reduction in GHGs from Eugene Water & Electric Board's (EWEB) electricity supply. For comparison, Eugene's population *increased* by 8% since 2010[7]. As a result, City operational emissions per resident served (MT CO_2e/person) has *decreased* by 22% since 2010.

To meet Eugene's Climate Recovery Ordinance GHG emissions target, emissions will need to *decrease* at least another 3,215 MT CO_2e (another 44% from to 2010 emissions) to meet the 60% mitigation target, with the remaining emissions either reduced or offset to become net neutral.

The City's GHG emissions from electricity have *decreased* by 406 MT CO_2e (-53% since 2010). District steam heat totaled 1,163 MT CO_2e in 2010 and was discontinued in fiscal year 2013; it was replaced with more efficient natural gas heating. Correspondingly, emissions from natural gas used to heat space and water at City facilities have *increase*d by 830 MT CO_2e or +38% since 2010.

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[1] City of Eugene Climate Recovery Ordinance (20567) https://www.eugene-or.gov/DocumentCenter/View/31138

[2] Scope 1 includes direct generated emissions from City-owned facilities, vehicles and equipment; scope 2 includes emissions from purchased electricity and district heating or cooling energy products. All inventory emissions sources are scope 1 or 2.

[3] If carbon neutrality is not achieved through operational changes, the CRO allows the remaining emissions to be offset through the funding of GHG reduction projects or the purchase of carbon offsets.

[4] Fugitive refrigerant leakage, a Scope 1 emissions source included in previous inventories, is excluded from this update because these emissions were previously found to be relatively small in scale and data is time intensive to collect.

[5] This inventory uses market-based accounting throughout for electricity. See Table 2 for location-based accounting.

[6] While inventories were conducted in 2000 and 2005, 2010 is the first year presented here because the City's Climate Recovery Ordinance (20567) states that targets should be set and measured against a 2010 baseline.

[7] Portland State University Oregon Population Report.

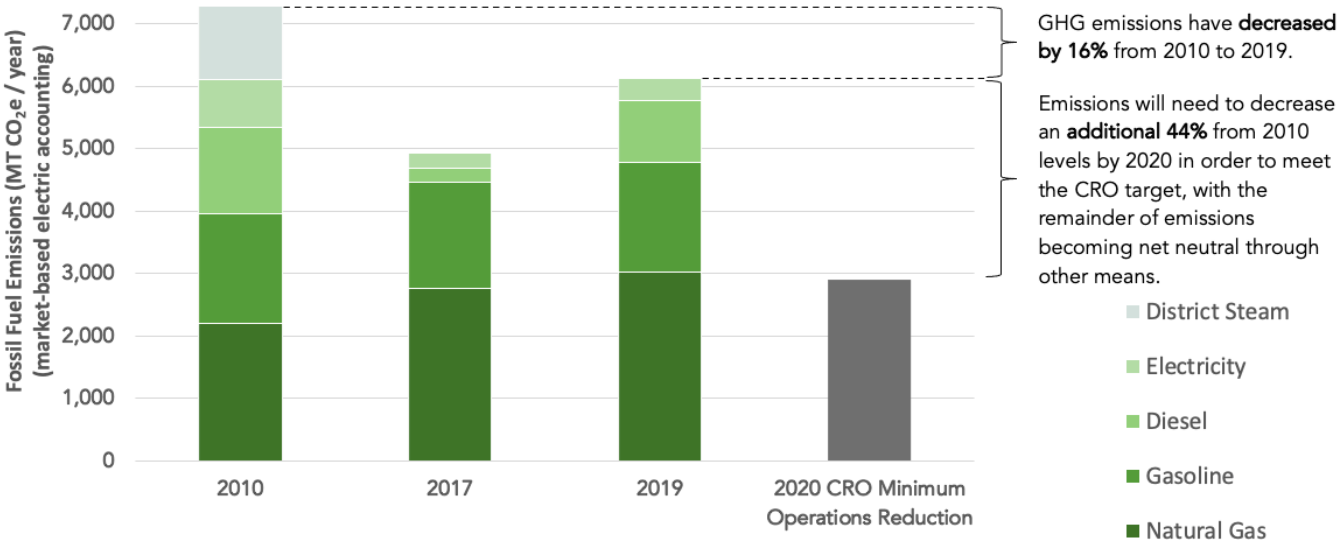
Table 1: Detailed breakdown of GHG change for 2010 vs 2019

Subsector	Difference 2010-2019 %	Difference 2010-2019 MT CO_2e	Notes
Natural gas	+38%	+830	Fuel substitute for district steam
Fleet	-13%	-411	Switch of diesel to renewable diesel
Electricity	-53%	-406	Market-based electric accounting
District steam	-100%	-1,163	Discontinued in fiscal year 2013
Total	-16%	-1,150	

Note: percentage figures are rounded.

Table 1 shows change in emissions from 2010 by source. Figure 1 shows emissions by GHG source for 2010 and 2019 compared to the CRO goal of carbon neutrality for City operations by 2020; 2017 is included for context. Note that the grey bar on Figure 1 represents the 60% mitigation target of the goal only.

Figure 1: Summary of market-based emissions for 2010, 2017, and 2019 versus the CRO target.



Changes in Emissions from 2017

While total emissions have decreased since 2010, emissions are up by 1,194 MT CO_2e (24%) compared to 2017. The largest increase from 2017 was from fleet diesel consumption by 764 MT CO_2e – this was due to renewable diesel market instability and additional cost of over $1 per gallon of fuel, causing fleet to buy diesel blends with lower percentages of renewable fuel. The market has since stabilized, and Fleet has returned to using R99 fuel.

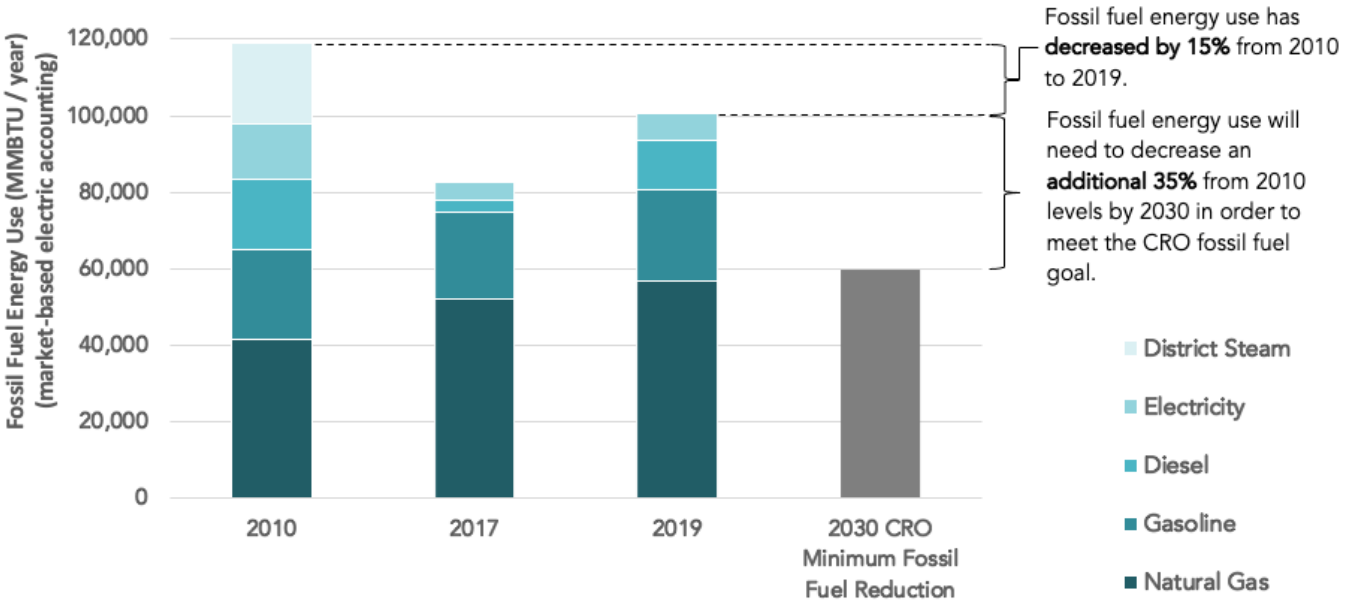
Facility increases in emissions from electricity and natural gas use are smaller. Natural gas emissions increased due to changing needs and maintenance at public facilities including the Airport, community pools, Downtown Library, and the Hult Center, primarily to increase services to residents. Electricity emissions increased due to a higher EWEB emissions factor.

Fossil Fuel Use

Figure 2 shows *fossil energy use* by source for 2010 and 2019 compared to the CRO goal of 50% fossil fuel reduction for City operations by 2030; 2017 is included for context. Note that the grey bar on Figure 2 represents the 50% minimum reduction component of the goal.

Similar to emissions, progress has lapsed since 2017 for all sources. Natural gas a fossil fuel, and use has increased due to changing needs and maintenance at public facilities. Electricity fossil fuel increased due to a higher fossil EWEB emissions factor, which is outside of City control. Diesel increased due to the higher percentages of fossil diesel in the fuel blends.

Figure 2: Summary of fossil fuel use for 2010 and 2019 versus the CRO goal, with 2017 for context.



Historic Inventories

Table 2 provides a summary of historic inventory results and provides a percent comparison of 2019 GHG emissions to 2010 GHG emissions. As can be seen, the City's electricity emissions have ***decreased*** by 51%. Note the difference in Table 2 in GHGs using the location-based and market-based accounting methods for electricity. These results show that the City's / EWEB's electricity supply contracts (market-based) are very low-GHG compared to emissions from average electricity generation for the regional electricity grid.

The implication of the two methods of accounting is that whatever electricity consumption reduction we have in Eugene, means EWEB can sell low GHG power to the grid to displace higher GHG sources of electricity in other communities.

Natural gas GHGs have increased since 2010, which might appear problematic. However, the reason for this increase was that natural gas was substituted in 2013 for district steam (less efficient), which had the net effect of lowering the City's GHGs for space heating. Total emissions increased by 24% from 2017 to 2019 from all activities, primarily from diesel emissions due to an unstable renewable fuel market. The renewable diesel market has since stabilized, and Fleet has returned to using R99 fuel.

Table 2: Detailed summary of Eugene's 2019 and historic emissions for emissions by energy type.
Notes: this table includes emissions using two accounting methods for electricity – location-based and market based. These two methods are described in more detail on page 7. ***The sub-totals (light green highlighted rows) include market-based emissions for electricity.*** *The Greenhouse Gas Protocol guidance states that market-based accounting is the preferred method for organizational goal-related tracking.*

Total Emissions (MT CO_2e / year)	2000	2005	2010	2013	2016	2017	2019	Change since 2010
Facilities	**3,481**	**3,809**	**4,119**	**3,381**	**2,661**	**3,014**	**3,380**	**-18%**
Electricity (Location-Based)	11,311	10,521	9,778	7,809	7,647	7,367	7,294	-25%
Electricity (Market-Based)	*823*	*765*	*762*	*537*	*257*	*247*	*356*	-53%
Natural Gas	1,939	2,324	2,194	2,844	2,404	2,767	3,024	+38%
District Steam	719	720	1,163	*Steam plant decommissioned in 2012*				-100%
Transportation	**3,305**	**3,307**	**3,157**	**3,274**	**3,228**	**1,917**	**2,746**	**-13%**
Gasoline	2,008	2,014	1,769	1,903	1,723	1,698	1,763	0%
Diesel	1,297	1,293	1,388	1,371	1,505	219	983	-29%
Total Emissions (Market-Based)	6,786	7,116	7,276	6,655	5,889	4,931	6,126	-16%

Table 3 shows a similar accounting as Table 2, except this table is based in units of fossil fuel. The fossil fuel accounting is used to track the City's progress towards the CRO's 2030 goal for fossil fuel use.

Note that for electricity there appears to be a large increase from 2017 to 2019; this is due to EWEB's emissions factor, not electricity consumption which only increased by less than 1%. Natural gas use increased by 10% due to changing needs and maintenance at public facilities.

Table 3: Detailed summary Eugene's 2019 and historic emissions by energy type.
Note: This table only includes Market-based accounting. This approach was selected by the City as the preferred approach for accounting towards the CRO fossil fuel target, per guidance from Greenhouse Gas Protocol – Scope 2 Guidance. The guidance states that market-based accounting is the preferred method for organizational goal-related tracking.

Total Energy (MMBTU / year)	2000	2005	2010	2013	2016	2017	2019	Change since 2010
Facilities	**N/A**	**N/A**	**77,082**	**63,815**	**50,151**	**56,815**	**64,042**	**-17%**
Electricity (Location-Based)	*Market-based accounting used for CRO fossil fuel target*							
Electricity (Market-Based)	*N/A*	*N/A*	*14,388*	*10,180*	*4,847*	*4,670*	*7,053*	-51%
Natural Gas	36,563	43,832	41,378	53,635	45,304	52,145	56,989	+38%
District Steam	12,951	*13,144*	*21,316*	*Steam plant decommissioned in 2012*				-100%
Fleet	**43,959**	**44,381**	**42,067**	**43,503**	**43,099**	**25,624**	**36,657**	**-13%**
Gasoline	26,669	27,151	23,587	25,228	23,031	22,705	23,564	0%
Diesel	17,290	17,230	18,480	18,275	20,068	2,919	13,093	-29%
Total Fossil Fuel Use (Market-Based)	**N/A**	**N/A**	**119,149**	**107,318**	**93,250**	**82,439**	**100,699**	**-15%**

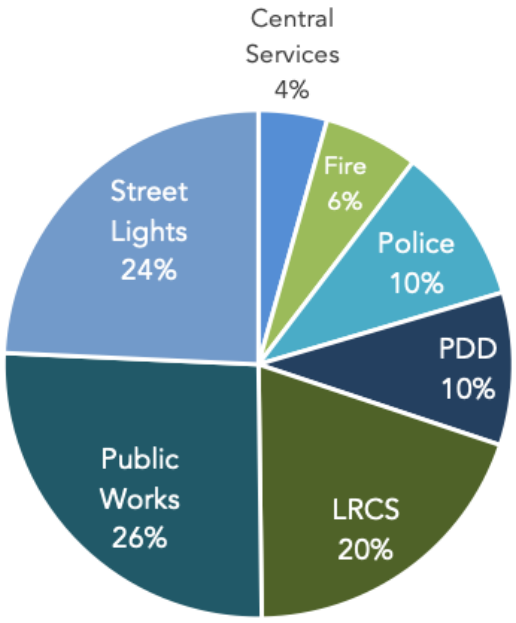
Note: Oregon Department of Environmental Quality does not provide an EWEB specific factor for fossil fuel use as they do provide for GHGs (MT CO_2e / MWh). Therefore Good Company calculated the values above using EWEB's GHG factor from ODEQ combined with factors from U.S. Energy Information Administration for natural gas (heat rate and GHG emissions factors). These factors were used to calculate the MMBTUs of fossil fuels for electricity assuming a natural gas benchmark.

DETAILED FINDINGS

Electricity

In 2019, City buildings consumed 25,000 MWh of electricity and emitted 356 MT CO_2e using market-based accounting. Within City operations, the largest consumers of electricity include: Street Lights; Public Works, and Library, Recreation, and Cultural Services (LRCS). Overall, the City's electricity use has decreased by 1.8% between 2010 and 2019 in terms of MWh consumed (not emissions). The City estimated Renewable Energy Credit purchases (confirmed renewable sources of electricity) equivalent to 5% of consumption. Market-based accounting is based on emissions from electricity supplied by EWEB; their emissions factor (quantity of CO_2e per kWh) increased from .010 to .015 MT CO_2e/MWh from the 2017 inventory.

Figure 3: Summary of 2019 electricity use by department/service area



Location vs. Market-Based Electricity Accounting

This inventory follows the *Local Government Operational Protocol* for the majority of emissions sources with an exception for electricity. More recent guidance is available that has become standard in the GHG inventory protocol, Greenhouse Gas Protocol's *Scope 2 Guidance*. *Scope 2 Guidance* suggests that organizations account for electricity emissions using two distinct accounting methods: Location-based[8] and Market-based.[9]

Table 4: Details of location-based and market-based emissions calculations.

Accounting Method	Provider	Energy Consumption	Emissions Factor	Total Emissions
Location-based	NWPP	25,000 MWh	.292 MT CO_2e/MWh	7,294 MT CO_2e
Market-based	EWEB	25,000 MWh	.015 MT CO_2e/MWh	356 MT CO_2e

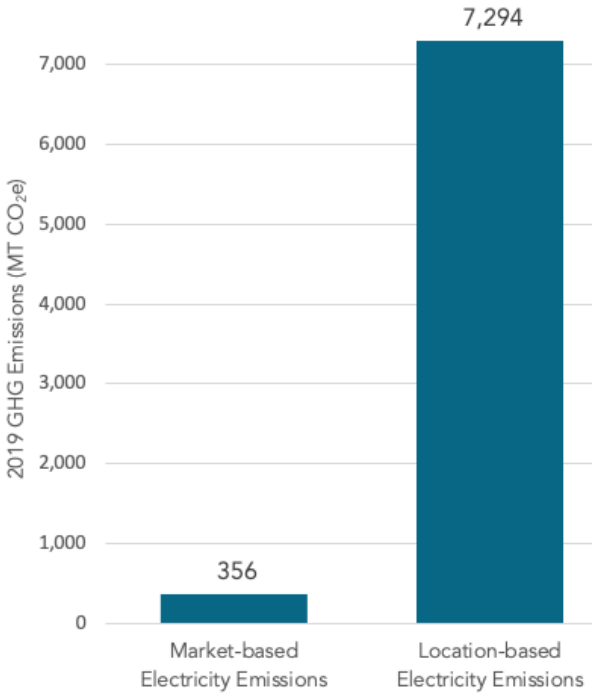
Note 1: Northwest Power Pool (NWPP) emissions factor is from eGRID 2018, the most recent factor available.
Note 2: EWEB's emissions factor is based on 2018 reporting to Oregon Department of Environmental Quality (ODEQ), and is the most recent factor available.

[8] **Location-based method (or regional grid)** represents the average emissions intensity of a specific electricity grid with defined geographic and temporal boundaries. For the NWPP, the boundary covers roughly seven states in the northwest continental U.S. It therefore represents the average GHG impacts associated with using or not using (due to efficiency or conservation) a kilowatt-hour of electricity by an organization. This method is focused on the connection between collective consumer demand and the emissions associated with supplying that demand and maintaining grid stability.

[9] **Market-based method (or utility-specific)** represents emissions from the electricity generation contracts that an organization has purposefully chosen. Related choices could include selection of a specific electricity utility (in markets with more than one); contracting with a specific supplier (in a Power Purchase Agreement (PPA)); or the purchase of renewable energy credits (RECs). This accounting method documents the carbon intensity of "contractual instruments" that convey the "environmental attributes" from a specific electricity supplier to the purchaser.

Figure 4 provides a comparison of GHGs calculated using the location-based and market-based accounting methodologies. As is shown in Figure 4, the City purchases its electricity exclusively from EWEB; therefore, market-based emissions are calculated solely using EWEB's utility-specific emissions factor, taking the City's purchase of Renewable Energy Credits into account. EWEB's emissions factor is approximately 20 times less carbon-intensive than the regional average because EWEB is predominantly supplied through contracts with Bonneville Power Administration (BPA) whose generation supply is largely from low-carbon, hydroelectric and nuclear resources. What supply is not from BPA comes from EWEB's owned-generation resources which are also from low-carbon sources (hydroelectric and wind).

Figure 4: Comparison of the City's location-based vs. market-based electricity emissions.

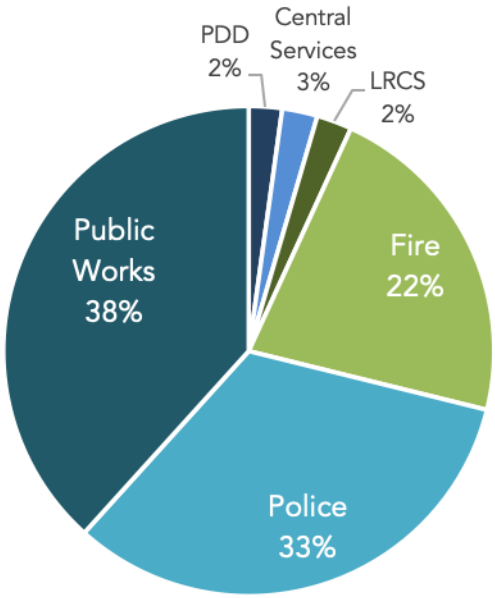


Fleet

In 2019, the City's fleet consumed 395,654 gallons of fuel and emitted 2,753 MT CO_2e.[10] The City's fleet is made up of a variety of vehicles and equipment that were primarily fueled in 2019 with gasoline blended with 10% ethanol (E10) and diesel fuel made with 50% renewable diesel (R50). The fleet also used a minor amount of B5 diesel blend as well as a small fraction of electricity. Fuel consumption (total gallons) went up 4%, but emissions went up by 43%. In previous years, R99 (99% renewable diesel) was the primary diesel blend; for FY19, diesel fuel was temporarily R50 instead of R99 due to market instability.

Approximately 53% of the City's liquid fuel-use are gasoline blends, and 47% are diesel blends. Renewable R50 diesel made up roughly 99% of the City's total diesel use in 2019. Fleet has since returned to R99 fuel. Figure 5 summarizes gas and diesel fuel volumes, by department. Within City operations the largest consumers of fleet fuels include Public Works, Police, and Fire & Emergency Services.

Figure 5: 2019 vehicle fuel volume by department

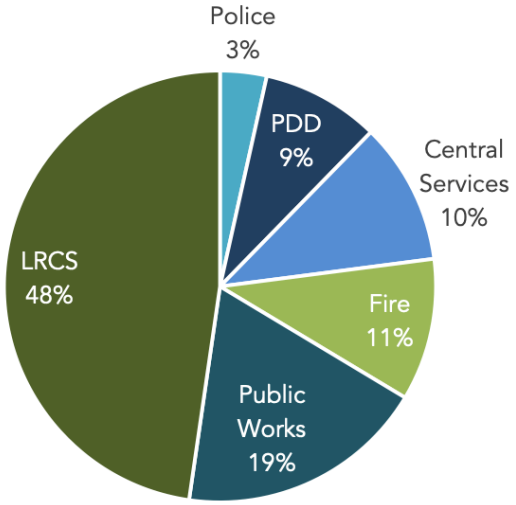


[10] It's important to note that Scope 3, upstream emissions from fuels are not being accounted for in these results. These emissions can be better or worse than conventional fuels, particularly for renewable and biofuels that require harvest of agricultural or forest inputs in their production. The City should require that fuel vendors provide lifecycle carbon intensity values (as certified under Oregon's Clean Fuels Program) by fuel blend and consider these values when purchasing bio and renewable fuel blends.

Facility Heat (Natural Gas)

In 2019, City buildings consumed 569,888 therms (MMBTUs) of natural gas and emitted 3,024 MT CO_2e. This is a 10% increase due to changing needs and maintenance at public facilities. Figure 6 summarizes natural gas use by department. Within City operations, the largest consumers of natural gas include LRCS facilities (largely from heating pool water), Public Works, and Fire.

Figure 6: 2019 natural gas use by department



City operations no longer use district steam as an energy source for heating; these facilities have been transitioned to high-efficiency, building-level natural gas furnaces, which resulted in a *net decrease* in overall GHG emissions, but an *increase* in natural gas use by City-owned facilities. The natural gas furnaces are more efficient at converting the fuel to heat than the aged district steam system was, which is why emissions are down since the transition. As a result of this and other factors (e.g. some winters are warmer than others), the City's emissions from natural gas have *increased* by 38% since 2010.

METHODOLOGY

Data for this inventory was provided by City staff and included facility electricity and natural gas use as well as fleet fuel use. Facilities staff developed a methodology and provided energy data that allows for allocation of facility energy use to multiple departments sharing the same facility.

The methodology used for this inventory follows The Climate Registry's *Local Government Operations Protocol*, which is supplemented with Greenhouse Gas Protocol's *Scope 2 Guidance*. City refrigerant emissions were not found to be large in previous inventories, and the data is time consuming to collect so there are excluded from the 2019 inventory. Note: Eugene's wastewater treatment plant emissions are under the management of a cooperative community partnership, Metropolitan Wastewater Management Commission (MWMC) and therefore is excluded from the City's inventory. MWMC completes independent GHG inventories and has inventories complete for calendar years 2010, 2012, 2014, 2016, and 2018.

Inventory data is cataloged in an Audit Trail, which documents and organizes all data files and related calculation files used to calculate the City's GHGs and fossil fuel use. GHGs and energy use are calculated with Good Company's Greenhouse Gas Calculator (G3C). Other resources related to Eugene' Climate Recovery Ordinance, including past GHG inventory reports, may be downloaded at https://www.eugene-or.gov/2170/Climate-Recovery-Resources. *Note that due to an update in previous years emissions factors and improved calculation methodology, the data in this document may not exactly match previous reports.*